MIL-C-19565(SHIPS)
15 August 1956

MILITARY SPECIFICATION

COATING COMPOUND, THERMAL INSULATION

PIPE COVERING —— FIRE-, WATER-,

AND WEATHER-RESISTANT

1. SCOPE

1.1 This specification covers protective coating compounds for thermal insulation on exterior steam systems operating at temperatures up to 400° F.

2. APPLICABLE DOCUMENTS

2.1 The following specifications and standards, of the issue in effect on date of invitation for bids, form a part of this specification:

SPECIFICATIONS

FEDERAL

HH-I-551 - Insulation Block and Pipe Covering, Thermal Cellular Glass.

TT-P-141 - Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling, and Testing.

MILITARY

MIL-C-124 - Containers (Cans, Pails and Drums) Metal (for Other Than Subsistance Items).

MIL-P-1264 - Paint, Outside, White (Formula No. 6).

MIL-I-2819 - Insulation, Thermal, Block.

MIL-C-3004 - Coating, Fire-Resistant, Adhesive (for Repairing Surface of Fibrous Glass Insulation Board).

MIL-B-19564 - Bedding Compound, Thermal Insulation Pipe Covering.

MIL-C-20079 - Cloth, Tape and Thread, Fibrous Glass.

FSC 5640

NAVY DEPARTMENT
General Specifications for Inspection of Material.

STANDARDS

FEDERAL
FED-STD-791 - Lubricants, Liquid Fuels, and Related Products; Methods of Testing.

MILITARY
MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer.)

2.2 Other publications.- The following documents form a part of this specification. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

CONSOLIDATED CLASSIFICATION COMMITTEE
Consolidated Freight Classification Rules.

(Application for copies should be addressed to the Consolidated Classification Committee, 202 Chicago Union Station, Chicago 6, III.)

DEPARTMENT OF COMMERCE
Code of Federal Regulations.

(Application for copies should be addressed to the Superintendent of Document, Government Printing Office, Washington 25, D. C.)

3. REQUIREMENTS

3.1 Qualification.- The coating compound furnished under this specification shall be a product which has been tested and has passed the qualification tests specified herein (see 6.2).

3.2 Material.- The compound shall be composed of resinous vehicles, solvents, asbestos fibers and fillers and shall contain no petroleum asphalts or oils. The compound shall be suitable for the purpose intended without heating or the addition of any other ingredients. It shall be free of all ingredients which may affect the serviceability or have a harmful effect on thermal insulation or on metal surfaces.

3.3 Stability.-

3.3.1 The compound shall not liver, settle or otherwise deteriorate when stored for a period of one-year in airtight containers (see 4.3.1).

3.3.2 It shall be stable and shall not be adversely affected on returning to room temperature after subjection to 16° Fahrenheit (F.) temperature for a period of 16 hours.

3.4 Consistency.- The cone penetration of the compound shall be not less than 30 or more than 38 millimeters (mm.)(see 4.3.2).

3.5 Flash point.- The flash point of the compound shall not be less than 80° F. (see 4.3.3).

3.6 Accelerated weathering.- The compound shall show no deterioration other than surface discoloration after being tested as specified in 4.3.4.

3.7 Permeance.- The compound shall have a permeance to water vapor of not more than 0.2 permeance (see 4.3.5).

3.8 Flexibility after exposure to heat.- The compound shall not chip, scale, crack or otherwise leave the surface of a metal strip when tested as specified in 4.3.6.

3.9 Protection against corrosion.- The compound shall protect bare steel from corrosion when tested as specified in 4.3.7.

3.10 Paintability.- The compound shall not cause discoloration or bleeding through a coat of paint conforming to Specification MIL-P-1264 and shall have good adhesion and compatability with the paint (see 4.3.8).

3.11 Fire resistance.- The compound shall not support combustion when tested as specified in 4.3.9.

3.12 Thermal shock.- The compound shall not become hard or brittle, shall not drip or run and shall not lose adhesion to insulation surfaces when tested as specified in 4.3.10.

3.13 Vibration stability.- The compound shall not lose adhesion to the insulation when tested as specified in 4.3.11.

4. QUALITY ASSURANCE PROVISIONS

4.1 Sampling.-

4.1.1 Lot.- For purposes of sampling, a lot shall consist of all coating compound from one production batch offered for delivery at one time.

4.1.2 Sampling procedure for lot acceptance inspection (at the place of manufacture).-

4.1.2.1 Sampling for examination of filled containers.- A random sample of filled containers shall be selected by the Government inspector in accordance with Standard MIL-STD-105 at Inspection Level I and Acceptable Quality Level = 2.5 percent defective for the examination specified in 4.2.1.

4.1.3 Sampling for tests (at a Government laboratory).- From each inspection lot, two containers shall be selected at random by the Government inspector. Unless otherwise specified in the contract or order, the samples so selected shall be forwarded by the Government inspector to the U.S. Naval Engineering Experiment Station, Annapolis, Maryland, for the tests specified in 4.2.2.

4.2 Inspection.-

4.2.1 Examination.- Each sample filled container shall be examined to verify conformance with the requirements of this specification. Any container in the sample having one or more defects or under required fill shall be rejected, and if the number of defective containers in any sample exceeds the acceptance number for the appropriate sampling plan of Standard MIL-STD-105, the lot represented by the sample shall be rejected. Rejected lots may be resubmitted for Government examination provided the contractor has removed or repaired all nonconforming containers.

4.2.2 Lot acceptance tests.- The sample specimens selected in accordance with 4.1.3 shall be subjected separately to the tests specified in 4.3.1.1, 4.3.2, 4.3.3 and 4.3.6 and to any additional tests deemed necessary by the Government laboratory to determine that the specimens conform with that given qualification. If either sample fails one or more of these tests, the lot shall be rejected. Rejected lots may be resubmitted for acceptance tests provided the contractor has removed or reworked all nonconforming products.

4.3 Test procedures.-

4.3.1 Stability.- The compound shall be stored for a period of one year in an airtight container. At the end of this period, the compound shall be examined to determine conformance with 3.3.1.

4.3.1.1 The compound shall be subjected to a temperature of 16° F. for 16 hours for stability before testing.

4.3.2 Consistency.-

4.3.2.1 Apparatus.- The apparatus used shall be as specified in method 311 of Standard FED-STD-791. The total weight of the cone and rod shall be 150 grams.

4.3.2.2 Procedure.- A thin film of water shall be floated on top of the test material during the test to prevent nonconformity due to evaporation or skinning. The open cup portion of the grease worker (see method 311 of Standard FED-STD-791) shall be completely filled with the well-mixed sample at a temperature of 77° ± 1° F. A straight edge shall be drawn across the surface of the sample to remove any excess material and to present a smooth surface. The apparatus shall be leveled and the plunger lowered until the tip of the penetrometer cone just touches the surface of the sample. The scale shall then be adjusted so that the scale actuating device is in contact with the top of the rod holding the penetrometer cone and the scale reading recorded. The plunger shall be released suddenly and kept released for 5 seconds. The scale actuating device shall be moved until it is again in contact with the top of the rod holding the penetrometer cone, and the scale reading recorded. The penetration is the difference between the two readings. Five tests shall be made and the average reported. The sample shall be smoothed over before each test.

4.3.3 Flash point.- The flash point shall be determined in accordance with method 1102 of Standard FED-STD-791.

4.3.4 Accelerated weathering.-

4.3.4.1 Apparatus.- The apparatus used shall be as specified in method 615.1 of Specification TT-P-141.

4.3.4.2 Procedure.- A block of thermal insulation conforming to class A of Specification MIL-I-2819, 6 by 4 by 2 inches thick shall be covered with a continuous piece of asbestos cloth cut so there are 4 minimum number of seams. The cloth shall be secured tightly to the block by means of staples. A 1/8 inch thick coat of the material shall be applied over the entire surface of the block. The specimen shall be air dried for 72 hours prior to exposure in the weathering apparatus.

4.3.4.3 Test.- The apparatus shall be operated for a period of 60 days according to a schedule consisting of ten 2-hours cycles (20 hours) per day. Each 2-hour cycle shall be divided into periods during which the test specimen shall be exposed to light without water spray for 102 minutes and to light with water spray for 18 minutes.

4.3.5 Water vapor permeability.-

4.3.5.1 Apparatus.- The apparatus shall consist of a test cabinet or chamber suitably equiped to provide conditioned air at 95 + 1° F. and 95 + 2 percent relative humidity, circulated at a rate of not less than 500 feet per minute across the exposed face of the test specimens.

(a) Test cups or dishes.- The test dishes or cups shall be constructed of any noncorrosive, impermeable material, so designed that the specimens can be sealed over the opening without the leakage of water vapor at or through the edges, and so that the exposed area of the specimens is the same on both sides.

(b) Template.- The template shall consist of a flat, rigid, circular metal disk with the edge bevelled to an angle of approximately 45 degrees. The diameter of the smaller face of the template shall be no greater than the diameter of the cup in contact with the specimen.

(c) Desiccant.- The desiccant shall be an hydrous calcium chloride that will pass a number 8 sieve and free of fines that will pass a number 30 sieve.

4.3.5.2 Test specimens.- The supporting membrane of the test specimen shall be of any porous, semi-rigid material such as the glass-cloth facing of fibrous glass hull insulation board. A 1/16-inch coat of the compound shall be applied to the supporting membrane by means of a doctor blade. The membrane shall be of sufficient size to yield 4 specimens. The coated specimens shall be air-dried for 72 hours prior to assembly.

4.3.5.3 Procedure.- The test cups shall be filled with desiccant to within 0.1 inch of the underside of the specimen.

(a) The test specimen shall be cut so that its diameter equals that of the larger diameter of the template. The coated specimen shall be placed over the aperture of the cup. A thin film of stop-cock grease shall applied to the beveled edge of the template. Any excess grease shall be wiped off. The template shall be centered over the specimen and molten wax shall be flowed into the annular space surrounding the beveled edge of the template by means of an eye dropper. When the wax has cooled and solidified, the template shall be removed.
(b) The test assemblies shall be weighed on an analytical balance to 0.0002 gram., Then the test assemblies shall be placed on a rack in the cabinet in an upright position so that the circulating air passes freely over the exposed surface of the specimens.
(c) Successive weighings of the assemblies shall be made at 24 hour intervals until a constant rate of gain is reached.

4.3.6 Flexibility.-

4.3.6.1 Apparatus.- The apparatus shall consist of the following:

(a) A panel 8 by 18 inches, 0.011 inch thick, made from bright tin-plate.
(b) A film applicator with a clearance of 1/16 inch and a gap of sufficient size to make a film 3 to 6 inches wide.
(c) A steel mandrel 1/4 inch in diameter and 6 inches long supported at each end.

4.3.6.2 Procedure.- The 8 by 18-inch tin panel shall be placed on a flat surface. Using the film applicator a film of the compound 18 inches long and 3 to 6 inches wide.shall be applied on the panel. The coated panel shall be air dried for 72 hours. Four 1-1/2 by 4 inch strips shall be cut from the coated panel. Two of the strips shall be placed in an electric air circulating oven and baked at a temperature of 212° to 221° F. for 75 minutes. The other two strips shall be placed in fresh water at a temperature of 75° F. for 48 hours. The strips shall be removed from the oven and water and allowed to cool to room temperature. Then the strips shall be bent rapidly over the surface of the mandrel. The strips shall be examined for cracks at the bend. Slight surface cracks shall be disregarded, but deep cracks which expose bare metal shall be considered as failure of the compound to pass the test.

4.3.7 Protection against corrosion.-

4.3.7.1 Apparatus.- The apparatus used shall be as specified in method 606 of Specification TT-P-141.

4.3.7.2 Procedure.- A 0.125 inch thick coating of the compound shall be applied to unprimed steel panels and air dried for 30 days. A line shall be scribed through the coating with a sharp instrument so as to expose the underlaying metal surface before testing. The coated panels shall be subjected to salt spray for 30 days. Then the panels shall be examined for signs of rusting or corrosion. There shall be not more than a 1/4 inch creep of rust under the coating and away from the line scribed through the coating.

4.3.8 Paintability.-

4.3.8.1 Procedure.- The specimen shall be prepared for test as specified in 4.3.4.2. After 72 hours drying time a top coat of outside white paint in accordance with Specification MIL-P-1264, shall be applied to the surface of the block.

4.3.9 Fire resistance.-

4.3.9.1 Preparation of test specimen.- A single layer of cellular glass pipe insulation, in accordance with Specification HH-I-551, shall be secured to a 36-inch length of 2 inch nominal size steel pipe. The insulation shall be secured to the pipe with wire or metal bands. The outer surfaces of the insulation shall be covered with a 1/16 inch coating of the compound. A layer of 2 inch glass cloth tape, in accordance with Specification MIL-C-20079, shall be spirally wrapped into the tack coat with 1/2 inch laps. A 1/8-inch coat of the compound shall be applied over the tape. The coated specimen shall be air dried for 7 days prior to testing.

4.3.9.2 Test.- For test, the specimen shall be placed in a horizontal position with the surface to be exposed to the fire facing downward, and shall be supported on the flat surface of a 2 by 2 by 1/8-inch steel angle frame. (Standard laboratory equipment has a 30 by 30-inch clear opening.) The flame from a 3/4 to 7/8-inch gas-air burner shall be directed against the center of the lower surface of the specimen. The top of the burner shall be directed against the center of the lower surface of the specimen. The top of the burner tube shall be 28-3/4 inches below the specimen. Temperature indications shall be obtained with a chromel-alumel thermo element made of 0.12849-inch wire placed in a 3-inch horizontal coil 1 inch below the center of the specimen. The wires shall be bare for a distance of 2 inches from the junction. Temperature readings shall be taken at intervals not exceeding 2 minutes.

4.3.9.3 The test duration shall be 40 minutes and the flame shall be regulated to give temperature indications according to the time temperature curve shown on figure 1. The flame shall touch the specimen during the entire test period. Exceptions can be made for the first 5 minutes, if required, for proper temperature regulation.

4.3.9.4 The area under the time temperature curve obtained from the thermo element readings shall be within 5 percent of that of the reference curve being followed.

4.3.9.5 The test shall be conducted in a room which is free from appreciable air currents and which has a temperature between 60° and 85° F.

4.3.10 Thermal shock test. -

4.3.10.1 Preparation of test specimen. - A 3-foot section of nominal 3-inch pipe shall be covered with four sections of 2-inch thick cellular glass insulation pipe covering in accordance with Specification HH-I-551. The bore, butt ends and faying surfaces shall be coated with a 3/16 inch layer of bedding compound in accordance with Specification MIL-B-19564. The sections of insulation shall be assembled on the pipe. Strips of 2-inch wide fibrous glass tape shall be immersed in an adhesive coating in accordance with Specification MIL-C-3004, and then wrapped around the insulation approximately 4 inches from the end of the insulation and spaced on 10-inch centers thereafter. The insulation shall be secured by means of the 1/2-inch wide galvanized steel bands centered over the strips of tape. The entire outer surface of insulation shall be covered with a 3/16-inch thick tack coat of the coating compound. A layer of 2-inch wide knitted glass tape, in accordance with Specification MIL-C-20079, shall be spirally wrapped with 1/2-inch laps into the tack coat. A 3/16-inch thick layer of the coating compound shall be applied over the tape. The specimen shall be air dried for 72 hours prior to test.

4.3.10.2 Test. - The specimen shall be heated to 400° F. in 30 minutes, subjected to that temperature for 8 hours and then cooled at room temperature for 16 hours. The specimen shall be subjected to this heating and cooling cycle five times.

4.3.11 Vibration stability test. - The specimen used in the thermal shock test, (see 4.3.10), shall be used in this test. The specimen shall be connected in a horizontal position in a vibration machine. In this position the specimen shall be subjected to 720 vibrations per minute through an arc of 15 minutes with a radius of 30 inches, for a period of 100 hours.

4.4 Qualification tests (at a Government laboratory).- Qualification tests shall be conducted at a Government laboratory designated by the Bureau of Ships. These tests shall consist of the tests specified in 4.3.

4.5 Inspection procedures.- For Naval purchases, the general inspection procedures shall be in accordance with General Specifications for Inspection of Material.

5. PREPARATION FOR DELIVERY

5.1 Packaging.-

5.1.1 Level A.- The compound shall be furnished in 1 gallon quantities in multifriction top cans conforming to type IV of Specification MIL-C-124.

5.1.2 Level C.- Compound shall be furnished in commercial containers normally used for that purpose.

5.2 Packing.-

5.2.1 Level A.- The containers shall be packed in accordance with the overseas shipment requirements of the appendix to Specification MIL-C-124.

5.2.2 Level B.- The containers shall be packed in accordance with the domestic shipment requirements of the appendix to Specification MIL-C-124.

5.2.3 Level C.- The compound shall be packed in a manner to insure carrier acceptance and safe delivery to destination at the lowest applicable rate. Containers shall comply with the Consolidated Freight Classification Rules.

5.3 Marking.- In addition to any marking required by the contract or order, interior and exterior containers shall be marked in accordance with Specification MIL-C-124, and the requirements of the Interstate Commerce Commission Regulations when applicable.

6. NOTES

6.1 Ordering data.- Procurement documents should specify the following:

(a) Title, number, and date of this specification.
(b) Selection of applicable levels of packaging and packing required (see 5.1 and 5.2).

6.2 Qualification.- With respect to products requiring qualification, awards will be made only for such products as have, prior to the time set for opening of bids, been tested and approved for inclusion in Qualified Products List QPL-19565, whether or not such products have actually been so listed by that date.

6.2.1 The attention of suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government, tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products covered by this specification may be obtained from the Chief of the Bureau of Ships, Department of the Navy, Washington 25, D.C.

Notice.- When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

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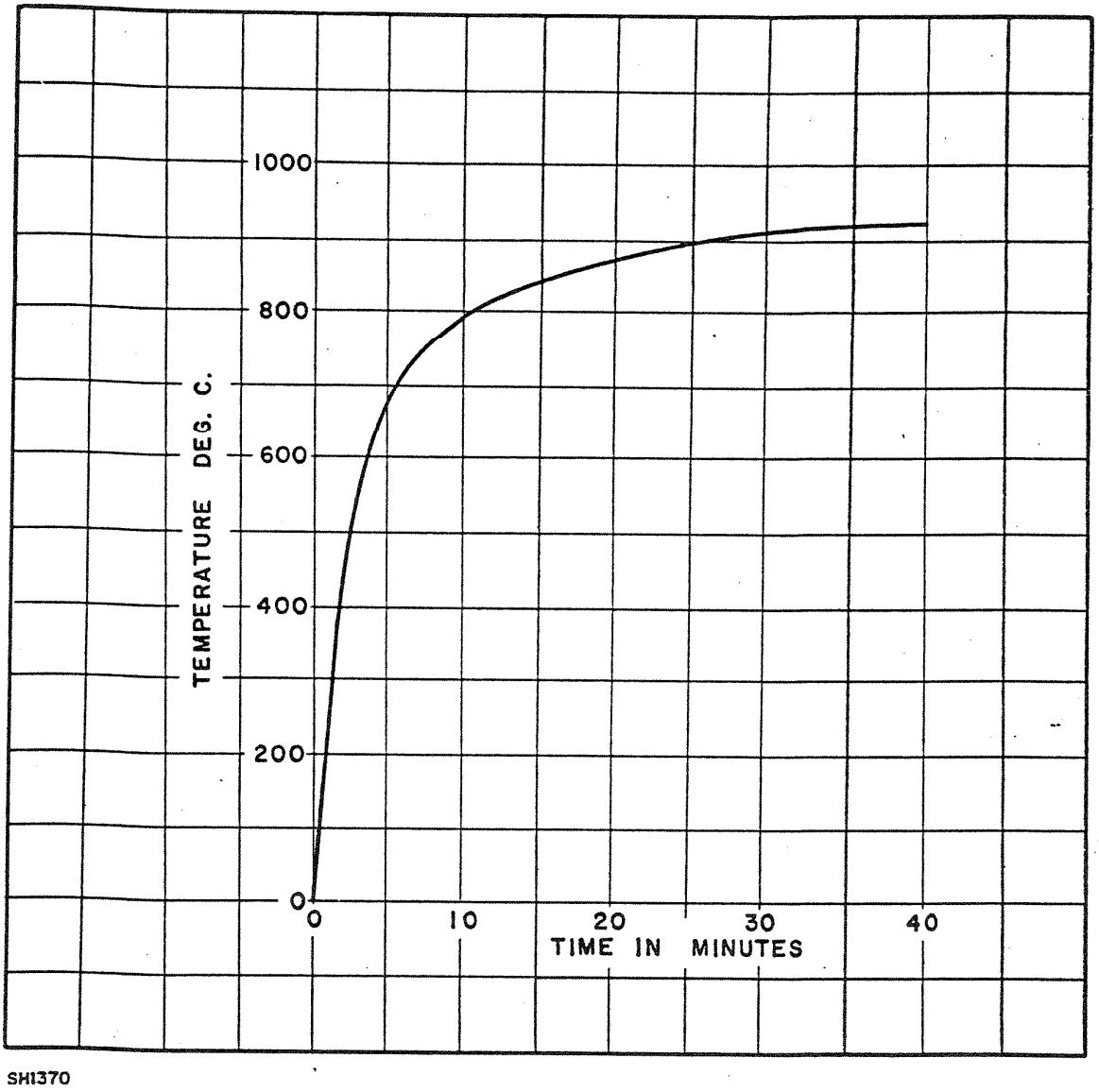

Figure 1 - Time temperature curve.